WHAT IS CLAIMED IS:

1   1.   Method of estimating an electrical capacitance of

2   a circuit component comprising:

3   -   a first rectangular conducting plate, having a

4   width W, a length L and a thickness t_{M1};

5   -   a second conducting plate, parallel to the first

6   plate and separated from the latter by a distance t_{ox},

7   having a rectangular central part facing the first

8   plate and a peripheral part surrounding said central

9   part;

10   -   a first homogeneous dielectric, of relative

11   dielectric permittivity ε_{ox}, placed between the first

12   and second plates and having a thickness of t_{ox} between

13   the two plates and of t_{oxst} in line with said peripheral

14   part of the second plate, so that said first dielectric

15   has a height step $t_{ox} - t_{oxst}$ around the perimeter of the

16   first plate; and

17   -   a second homogeneous dielectric, of relative

18   dielectric permittivity ε_E, surrounding the first plate

19   and the first dielectric,

20   the method comprising the estimation of the capacitance

21   of the component as a sum of several terms including at

22   least two terms of the form $C_0.W.L$ and $C_1.2(W+L)$, with

23    $C_0 = \dfrac{\varepsilon_0 \cdot \varepsilon_{ox}}{t_{ox}}$ and $C_1 = \dfrac{\varepsilon_0}{\pi} \cdot K \cdot Ln(a)$,

24   • ε_0 being the dielectric permittivity of free space,

25   • $K = \dfrac{\varepsilon_{Ox} \cdot \varepsilon_E}{\varepsilon_{Ox} - \left[\dfrac{(\varepsilon_E - \varepsilon_{Ox})^2}{(\varepsilon_E + \varepsilon_{Ox})} \cdot \dfrac{t_{OxSt}}{t_{Ox}} \right]}$,

26   • $a = -1 + 2k^2 + 2k\sqrt{k^2 - 1}$ with $k = 1 + \dfrac{t_{M1}}{t_{Ox}}$.

1   2.   Method according to Claim 1, wherein the terms of

2   the sum furthermore include two terms of the form

3     $[C_2(W) + C_3(W)] \cdot 2L$ and $[C_2(L) + C_3(L)] \cdot 2W$, with, for $x = W$ or L :

4     $C_2(x) = \dfrac{\varepsilon_0}{\pi} \cdot K \cdot Ln(\dfrac{u(x)}{a})$ and

5     $C_3(x) = \dfrac{\varepsilon_0 \cdot \varepsilon_{Ox}}{\pi} \cdot \left[2 - Ln4 - Ln(1 - 2\exp(-2\theta(x))) \right]$,

6   • the quantity $u(x)$ being an estimate of a solution

7   of the equation

8     $\dfrac{\pi}{2}\dfrac{x}{t_{Ox}} = -\dfrac{a+1}{\sqrt{a}} ln\left(\dfrac{R(x)+1}{R(x)-1}\right) + \dfrac{a-1}{\sqrt{a}}\dfrac{R(x)}{(R(x)^2-1)} + ln\left(\dfrac{R(x)\sqrt{a}+1}{R(x)\sqrt{a}-1}\right)$

9   with $R(x) = \sqrt{\dfrac{u(x)-1}{u(x)-a}}$, and

10   • $\theta(x) = 1 + \pi\dfrac{x}{2t_{Ox}}$.

1   3.   Method according to Claim 2, wherein the quantity

2     $u(x)$ is obtained using an iterative method of obtaining

3   an approximate solution of an equation.

1   4.   Method   according   to   Claim 3,   wherein   said

2   iterative method is Newton's method.

1   5.   Method according to Claim 1, wherein said circuit

2   component is a capacitor, and wherein the first and

3   second conducting plates each comprise one plate of

4   said capacitor.

1   6.   Method according to Claim 1, wherein the first and

2   second conducting plates each comprise a portion of

3   electrical signal transmission tracks.

1   7.   Method according to Claim 1, wherein the second

2   conducting plate comprises a conducting substrate

3   carrying the first and second dielectrics and the first

4   conducting plate.

1   8.   Method of numerically simulating the electrical

2   operation of a circuit, the simulation method using at

3   least one capacitance of a circuit component estimated

4   according to Claim 1.

1   9.   Method of determining a dimension of a capacitor

2   of electrical capacitance C_u comprising :

3   -   a first rectangular conducting plate, having a

4   width W, a length L and a thickness t_{M1};

5   -   a second conducting plate, parallel to the first

6   plate and separated from the latter by a distance t_{ox},

7   having a rectangular central part facing the first

8   plate and a peripheral part surrounding said central

9   part;

10   -   a first homogeneous dielectric, of relative

11   dielectric permittivity ε_{ox}, placed between the first

12   and second plates and having a thickness of t_{ox} between

13   the two plates and of t_{oxst} in line with said peripheral

14   part of the second plate, so that said first dielectric

15   has a height step $t_{ox} - t_{oxst}$ around the perimeter of the

16   first plate; and

17   -   a second homogeneous dielectric, of relative

18   dielectric permittivity ε_E, surrounding the first plate

19   and the first dielectric,

20   the method comprising the calculation of a first

21   approximate value L_1 of the length L as a sum of first

22   terms including C_u and at least one term of the form

23   $- 2 \cdot C_1 \cdot W$ divided by a sum of second terms including

24   at least two terms of the form $C_0.W$ and $2.C_1$, with

25    $C_0 = \dfrac{\varepsilon_0 \cdot \varepsilon_{Ox}}{t_{Ox}}$ and $C_1 = \dfrac{\varepsilon_0}{\pi}.K.\ln(a)$,

26   • ε_0 being the dielectric permittivity of free space,

27   • $K = \dfrac{\varepsilon_{Ox} \cdot \varepsilon_E}{\varepsilon_{Ox} - \left(\dfrac{(\varepsilon_E - \varepsilon_{Ox})^2}{(\varepsilon_E + \varepsilon_{Ox})} \cdot \dfrac{t_{OxSt}}{t_{Ox}}\right)}$,

28   • $a = -1 + 2k^2 + 2k\sqrt{k^2 - 1}$ with $k = 1 + \dfrac{t_{M1}}{t_{Ox}}$.

1   10. Method according to Claim 9, wherein said first

2   terms furthermore include two terms of the form

3    $- 2 \cdot C_2(L_0).W$ and $-2.C_3(L_0).W$, L_0 being a defined initial

4   value and wherein said second terms furthermore include

5   two terms of the form $2.C_2(W)$ and $2.C_3(W)$, with for

6    $x = W$ or L_0 : $C_2(x) = \dfrac{\varepsilon_0}{\pi} \cdot K \cdot \ln(\dfrac{u(x)}{a})$, and

7    $C_3(x) = \dfrac{\varepsilon_0 \cdot \varepsilon_{Ox}}{\pi} \cdot \left[2 - \text{Ln}4 - \text{Ln}(1 - 2\exp(-2\theta(x)))\right]$,

8   • The quantity $u(x)$ being an estimate of a solution

9   of the equation :

10    $\dfrac{\pi}{2}\dfrac{x}{t_{Ox}} = -\dfrac{a + 1}{\sqrt{a}}\ln\left(\dfrac{R(x) + 1}{R(x) - 1}\right) + \dfrac{a - 1}{\sqrt{a}}\dfrac{R(x)}{(R(x)^2 - 1)} + \ln\left(\dfrac{R(x)\sqrt{a} + 1}{R(x)\sqrt{a} - 1}\right)$

11   with $R(x) = \sqrt{\dfrac{u(x) - 1}{u(x) - a}}$, and

12   • $\theta(x) = 1 + \pi\dfrac{x}{2t_{Ox}}$.

1   11. Method according to Claim 10, wherein the quantity

2   $u(x)$ is obtained using an iterative method of an

3   approximate solution of an equation.

1   12. Method according to Claim 11, wherein said

2   iterative method is Newton's method.

1   13. Method according to Claim 10, which furthermore

2   includes the calculation of the quantities $C_2(L_1)$ and

3   $C_3(L_1)$, and comprises the calculation of a second

4   approximate value L_2 of the length L as a sum of third

5   terms divided by a sum of fourth terms, said third

6   terms comprising C_u, $-2.C_1.W$, $-2 \cdot C_2(L_1) \cdot W$ and $-$

7   $2.C_3(L_1).W$, said fourth terms comprising $C_0.W$, $2.C_1$,

8   $2.C_2(W)$ and $2.C_3(W)$.

1   14. Method according to Claim 10, wherein the initial

2   value L_0 is equal to the width W.

1   15. Computer program comprising instructions for

2   applying a method according to Claim 1, when the

3   program is run in a computer.

1   16. Computer program comprising instructions for

2   applying a method according to Claim 9, when the

3   program is run in a computer.